MONTHLY JOURNAL OF
THE MUSHROOM GROWERS'
ASSOCIATION

MGA
BULLETIN

JUNE 1960 · NUMBER 126

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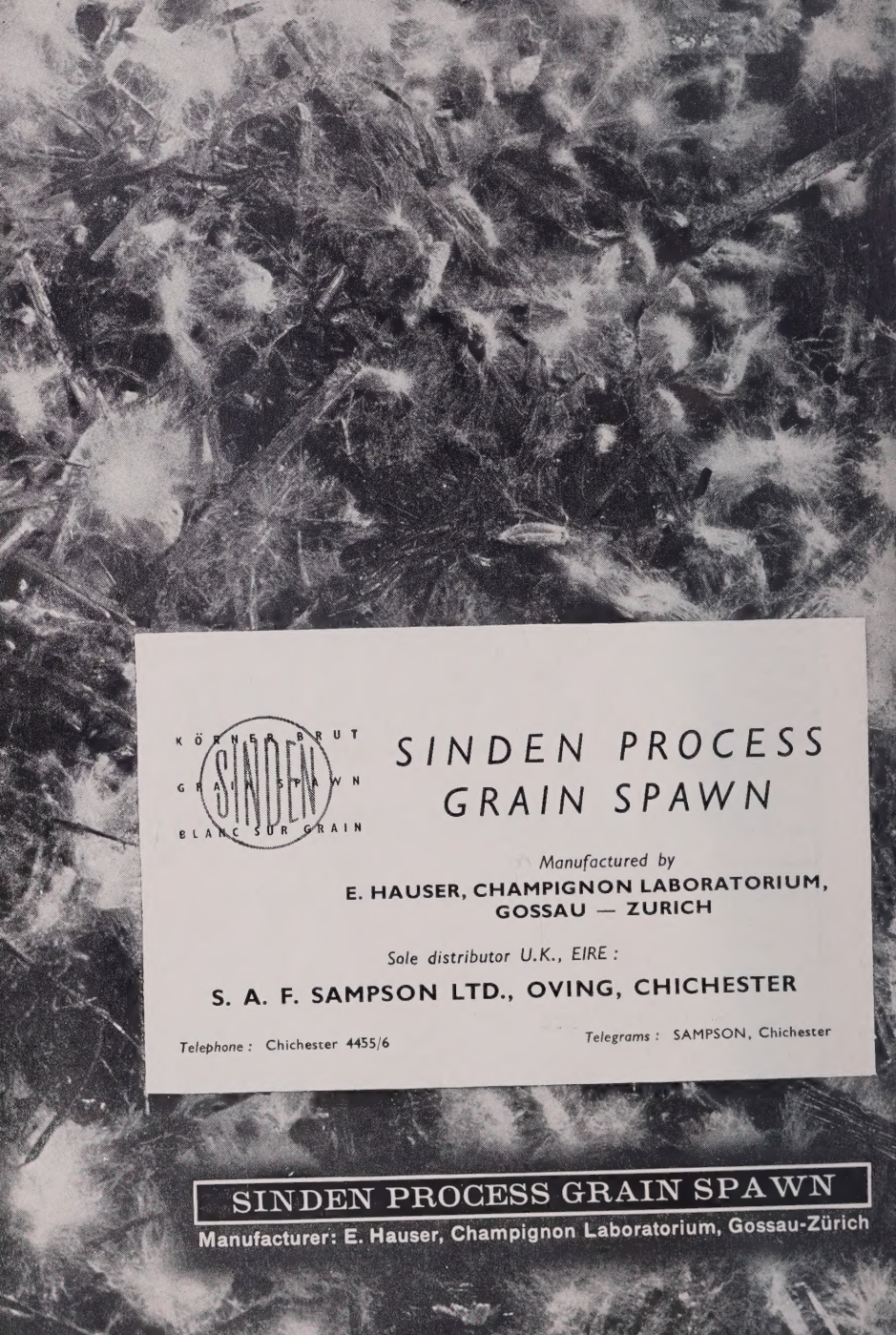

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The
MGA BULLETIN

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EDITORIAL

PLAIN TALK

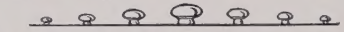
Among the short speeches made by former MGA Chairmen at the recent Annual General Meeting of the Association, was this by **Mr. G. V. Allen** of Bilting, Kent, who returned this year to the Executive Committee and who is the new Chairman of the Publicity sub-Committee.

He said, " I deplore the attitude of some members who are continually making and passing on derisive comments about those members who serve on MGA Committees and who give up their time quite voluntarily in order to assist the Association. Some of these people who complain do not themselves undertake any of the work and responsibility. There are many members who appear only to consider what they can get out of the Association and rarely if ever consider what they can put into it. Their attitude is of the " I'm all right Jack " type or " You help me when I want it but do not worry me with anyone else's troubles." I consider that many of these members are really only Associates, with no reflection at all upon the genuine Associate Members, some of whom often do more for the MGA than do the full members. I think everyone should pull his or her weight and give full support to the Association, its aims and its objects, and they should not be content to always remain back-benchers. Take this oil question, for instance. Some people have joined, taken the rebates but failed to back the scheme. I think this scheme should be backed just as strongly as the publicity scheme. The Executive Committee from time to time decide on a number of matters and I think we should have 100 per cent co-operation on such decisions, decisions which are taken for the general good of the Association and for the good of the whole mushroom growing industry ".

AREA MEETING FOR GROWER MEMBERS

Because of the extreme limitations of the available accommodation, only Grower Members in Area C were invited to a meeting, held in April, at the White Lion Inn, Church Lawford, Rugby, arranged by Mr. N. R. Cooper of Kimcote, Rugby, a former member of the MGA Executive.

The present Executive policy with regard to the interchange of information amongst members was discussed and considerable time was also devoted to an exchange of ideas on ways and means of further publicising mushrooms. The possibility of farm walks in the Area was also considered. An Area Committee has now been formed with the present Area representative, Mr. Fred. C. Atkins, as Chairman and Mr. Cooper as Secretary. Any correspondence regarding area matters should be sent to Mr. Cooper.



WE ARE SUBSIDISING CUCKOOS!

Right off the reel, I make no apology
For attacking this ideology
Of deliberate Summer Publicity—
Page one-six-eight, paragraph three.
Ten years ago, our biggest Summer crash
(With its compensating soft backwash
Creating an unprecedented crush
For buttons, cups and wild, wild Mush)
Had proved to be a blessing in disguise
To those of stable habits—and *stable* ties—
(Bona-fide growers) suddenly oppressed
By Summer-Cropping Cuckoos in the nest.
These cuckoo-growers soon deflate
Any demand that we create,
But, if we switch to Winter Ads.,
Stop subsidising these cuckoo cads,
While they grow *cold* at our expense
They'll soon grow cold in another sense,
And those of us, who crop all year,
Can change our pace to lower gear
For those hot months, and, learn to take
A carefree holiday by a lake,
With houses running at lesser pace,
And not competing in a break-neck race;
By end of August, cuckoos who lack pipe-heat
Will be so sick and in retreat,
That we, with boilers at the ready,
Can reap rewards, with prices steady
From appetites well whetted by migrant birds,
And thus, I'm saying, in a lot of words,—
This Summer-Publicity must surely be
' Barking up the wrong tree.'
(Come, regular growers! 'Twould pay, for once,
To run a loss, in hottest months!)

F.P. (BELFAST).

MY WAY OF GROWING

The Editor is anxious to receive articles from members on any aspect of mushroom growing, particularly " My Way of Growing " which has, in the past proved extremely popular. An article, under this heading, will appear in the July Bulletin together with one on " Watery Stipe " by Miss Gandy of the Glasshouse Crops Research Institute, and a special supplement outlining the publicity activities which have been going on for the past few months. Payment is made for all articles used.

TO MARRY

Miss Valerie Baker, daughter of Mr. and Mrs. G. W. Baker of Oxted, Surrey is to be married at St. Peter's Church, Limpsfield, Surrey at 12.15 p.m. on Saturday, 18th June, to Mr. Peter March, a B.B.C. cameraman of Highgate, London. Miss Baker is the MGA's Public Relations Officer.

STUDIES ON THE INFLUENCE OF CARBON DIOXIDE ON THE CULTIVATED MUSHROOM

By **Dr. H. J. Tschierpe**

Institut für Gemüsebau der Technischen Universität Berlin
Direktor Prof Dr. H. Riethus

(*The original paper was published in "Die Gartenbauwissenschaft 24, 1, 18-75, 1959*)

THE INFLUENCE OF CARBON DIOXIDE ON MUSHROOM MYCELIUM

C. THE GROWTH OF MYCELIUM IN DIFFERENT GAS MIXTURES

3. Results

In order to have a general view of these experiments the results are given in the following tables. The figures given are average data of six replicates. The first column gives the gas mixture, in which the mycelium grew, in the second column the growth of the colony diameter during the treatment (at the beginning the colony diameter was between 10 and 20 mm). The average superficial (area) growth per day (the total superficial growth divided by the number of days treatment) is given in the third column, in the fourth column the average superficial growth in per cent: these data are based on the treatment with the largest diameter (= 100%).

If one takes into account that the mycelial growth in a homogeneous substratum (spawn medium, compost, etc.), is not only superficial—as on agar—but in three dimensions, one must, in order to transfer the results obtained in vitro—to the conditions in vivo, calculate the volume of the sphere equivalent to the measured diameter. The last column gives the volume of this sphere taking the average colony diameter as a base. It can be seen that the differences between the treatments were highly significant.

4. Discussion

The results obtained establish the oxygen requirement of the mycelium and prove the inhibiting influence of carbon dioxide.

In CO_2-free gas mixtures composed of nitrogen and oxygen (oxygen content 5, 10, 15, 20 and 30 volume per cent) the growth of the mycelium is nearly the same. The mycelium of the cultivated mushroom therefore responds to the oxygen content of the atmosphere in the same way as other Eumycetes; it is not inhibited by low oxygen contents. A significant growth inhibition, however, is caused by increasing CO_2-concentrations. At CO_2-concentrations of more than 32 volume per cent the growth of the mycelium is completely stopped. The curve on the graph (Fig. 8) shows, that even low CO_2-concentrations cause a significant retardation of growth. The growth inhibition of mycelium growing on organic material in tightly closed bottles and observed by

1. Mycelium experiment

Four different treatments: 1. Pure carbon dioxide; 2. Mixture of 25 per cent carbon dioxide, and 75 per cent nitrogen; 3. Mixture of 10 per cent carbon dioxide, 10 per cent oxygen, and 80 per cent nitrogen; 4. Mixture similar to normal air but without any carbon dioxide.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 100% CO_2	2·3	5·5	2·21	6·043
2. 25% CO_2 75% N_2	3·9	10·31	4·09	9·095
3. 10% CO_2 10% O_2 80% N_2	29·1	116·81	46·38	65·438
4. 21% O_2 79% N_2	49·9	251·84	100·00	182·656

2. Mycelium experiment

Oxygen content constant 30 per cent. Increase of CO_2-concentrations at the expense of nitrogen.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 32% CO_2 30% O_2 38% N_2	7·0	11·80	4·43	3·208
2. 16% CO_2 30% O_2 54% N_2	20·7	50·67	19·05	16·802
3. 8% CO_2 30% O_2 62% N_2	31·9	99·17	37·29	43·747
4. 2% CO_2 30% O_2 68% N_2	42·9	165·15	62·10	90·173
5. 0% CO_2 30% O_2 70% N_2	57·5	265·92	100·00	177·566

Lambert (1958) and other research workers must be considered as a result of the high CO_2-concentration therein. In the same way might be explained the reduced productive capacity of mycelium grown under closed-room conditions as observed by **Mader** (1943). In the separated " dead ends " of the mines used in his experiments (" inside ") there must have been high CO_2-concentrations (**Mader** did not mention CO_2-determinations carried out in these dead ends). This high CO_2-concentration in the compost air inhibited the growth of the mycelium; the amount of compost grown through by the mycelium was less " inside " than in the control plots, grown in a ventilated room (" outside "). When the " inside " spawned trays after casing were moved " outside " and when the crops were compared, these trays, cultivated " inside " during the spawn running time, showed a reduction in yield of about 50 per cent.

The object of the mycelium during sporophore formation and during sporophore development is mainly to absorb and to transport water and nutrients to the fruitbodies, i.e., the mycelium has something like a " root " function. The mycelium grown " inside " however, had —as a result of the high CO_2-concentrations—less completely grown through the compost than the " outside " grown trays. Therefore the sporophores growing on " inside " trays had less " root-sphere " than the sporophores growing on " outside " trays. This fact might be responsible for the reduction in yield. **Mader** characterizes the growth of the mycelium " outside " and " inside " as excellent, but one cannot determine the real growth by ocular judgment.

Sinden (1935) obtained in spawn production a faster growth of the mycelium on sterile grains by adding a slightly soluble calcium salt, preferably calcium carbonate, to the substrate. He supposes " that the phosphate metabolism of the fungus growing in the cereal substrate is affected, since calcium controls the intake and utilization of phosphate in both plants and animals ". In the presence of H_2CO_3 however, the calcium carbonate is converted to $Ca(HCO_3)_2$. In this reaction considerable amounts of carbon dioxide are consumed. It seems not improbable that the faster growth described in presence of $CaCO_3$ can be traced back to the carbon dioxide fixation in the $Ca(HCO_3)_2$ and to the resulting decrease of the CO_2 level in the spawn bottle. This seems to be supported by that fact that **Sinden** used preferably $CaCO_3$ and no other Ca-salts. An exact solution of this question would be important.

The experiments described here show that the widely held opinion that during the spawn run absolutely no fresh air is necessary, can be very misleading, a fact which **Edwards** (1955) has already pointed out. In cropping rooms, tightly closed and with no connection to the surrounding fresh outside air, the CO_2 developed from the mycelium and the compost can cause a considerable growth inhibition and in extreme cases the mycelium growth could be stopped as in a tightly closed bottle.

In practice the conditions differ from farm to farm and it seems nearly impossible to lay down data about the frequency of air changes for universal application. It must, however, also be pointed out that

3. Mycelium experiment

Oxygen content constant 20 per cent. Increase of CO_2-concentrations at the expense of nitrogen.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 24% CO_2 20% O_2 56% N_2	21·7	8·90	7·69	4·987
2. 16% CO_2 20% O_2 64% N_2	32·4	21·20	22·08	17·477
3. 8% CO_2 20% O_2 72% N_2	39·6	30·40	35·37	33·504
4. 4% CO_2 20% O_2 76% N_2	53·7	39·10	64·22	81·519
5. 20% O_2 80% N_2	67·0	50·20	100·00	158·864

4. Mycelium experiment

Oxygen content constant 15 per cent. Increase of CO_2-concentrations at the expense of nitrogen.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 16% CO_2 15% O_2 69% N_2	18·2	61·47	23·83	17·559
2. 8% CO_2 15% O_2 77% N_2	28·6	113·67	44·07	38·785
3. 4% CO_2 15% O_2 81% N_2	37·6	184·58	71·56	82·539
4. 15% O_2 85% N_2	43·8	257·92	100·00	130·774

5. Mycelium experiment

Oxygen content constant 10 per cent. Increase of CO_2-concentrations at the expense of nitrogen.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 32% CO_2 10% O_2 58% N_2	1·3	1·64	1·13	1·022
2. 16% CO_2 10% O_2 74% N_2	23·4	55·82	38·42	22·445
3. 8% CO_2 10% O_2 82% N_2	35·3	106·05	72·99	54·351
4. 10% O_2 90% N_2	42·6	145·29	100·00	77·937

too much ventilation during the stage of mycelium growth can change the relative humidity and the temperature to a undesirable extent. Moreover, one must consider the danger of contamination, which increases if ventilation is increased. Growth of the mycelium could be damaged more by that than by a CO_2-content of one per cent in the compost-air. If it is possible to keep the relative humidity and the temperature at a optimum and if one can prevent contamination, ventilation can be recommended at any rate, because ventilation causes a decrease of the CO_2-content in the room and compost air, which is necessary for optimum growth.

The growth inhibition caused by carbon-dioxide can be shown even more clearly as in Figure 8 when one uses a log-log scale for the graph. If one plots the logarithm of the CO_2 concentration versus the logarithm of the percentage inhibition of growth at that concentration, these data will fit a straight-line curve (**Bateman,** 1933). The slope of the straight-line curve is smaller, the deeper the species lives in the soil.

The figure 9 and 10 show the straight lines, which were found by **Bateman** (1933) and **Durbin** (1955) and characterize the behaviour of six fungi and one bacterium. As it can be seen from the curve in Figure 11, established according to the results obtained in our experiments, the mushroom mycelium has the same behaviour as other fungi living in the upper parts of the soil. The straight-line curve (Fig. 11) has a steep slope, which indicates the strong CO_2 sensitivity of the mushroom mycelium.

The straight-line in Figure 11 was drawn from figures of the superficial growth, hence the curve does not show the conditions as they are in the compost. As already mentioned, the mycelium grows through a compost or spawn-medium in three dimensions. The growth inhibition, caused by carbon-dioxide, is therefore greater in the compost, i.e., the

6. Mycelium experiment

Oxygen content constant 5%. Increase of CO_2-concentrations at the expense of nitrogen.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 32% CO_2 5% O_2 63% N_2	5·4	9·95	3·91	3·705
2. 16% CO_2 5% O_2 79% N_2	19·80	55·90	21·89	18·744
3. 4% CO_2 5% O_2 91% N_2	33·0	129·78	50·83	60·651
4. 5% O_2 95% N_2	53·0	255·33	100·00	153·534

7. Mycelium experiment

Nitrogen content constant. Increase of CO_2-concentrations at the expense of oxygen.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 24% CO_2 76% N_2	2·50	2·91	1·45	·998
2. 16% CO_2 4% O_2 80% N_2	15·30	35·44	17·69	10·534
3. 8% CO_2 12% O_2 80% N_2	29·30	99·77	49·79	43·090
4. 4% CO_2 16% O_2 80% N_2	39·70	157·46	78·59	79·268
5. 20% O_2 80% N_2	47·50	200·35	100·00	109·164

angle to the horizontal co-ordinate would be even greater for mycelium, grown under natural conditions. These data could only be obtained with dry-weight determinations of a mycelium grown under corresponding conditions. The methods applied made these determinations impossible.

8. **Mycelium experiment**

Nitrogen content constant. Increase of CO_2-concentrations at the expense of oxygen.

TREATMENT	Growth of diameter in mm. at the end of the treatment	Average superficial growth per day in mm^2 (square millimetre)	Average superficial growth in per cent	Equivalent sphere at the end of the treatment in mm^3 (cubic-millimetre)
1. 20% CO_2 80% N_2	3·3	4·25	2·11	·357
2. 15% CO_2 5% O_2 80% N_2	20·3	71·54	35·62	13·033
3. 10% CO_2 10% O_2 80% N_2	26·7	108·34	53·95	26·089
4. 5% CO_2 15% O_2 80% N_2	34·0	146·94	73·17	38·233
5. 20% O_2 80% N_2	38·7	200·80	100·00	61·589

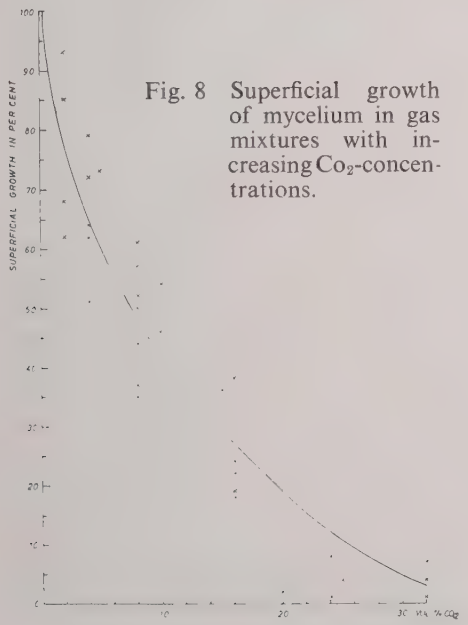


Fig. 8 Superficial growth of mycelium in gas mixtures with increasing Co_2-concentrations.

Growth inhibition caused by carbon dioxide.

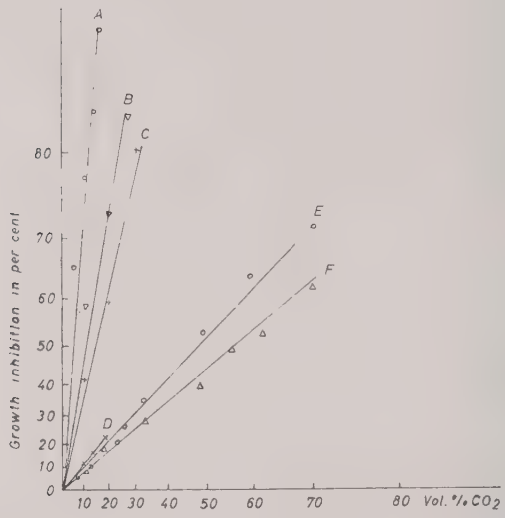


Fig. 9 A. Penicillium nigricans, B. Alternaria grossulariae, C. Cladosporium herbarum, D. Ophiobolus graminis, E. Fusarium oxysporum and F. Fusarium solani f. eumartii (after Bateman, 1933).

Growth inhibition caused by carbon dioxide

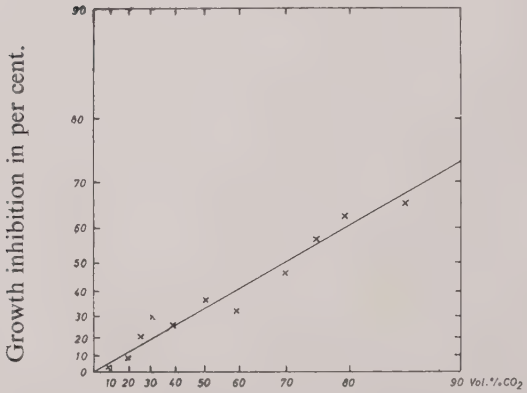


Fig. 10 Escherichia coli (after Durbin, 1955).

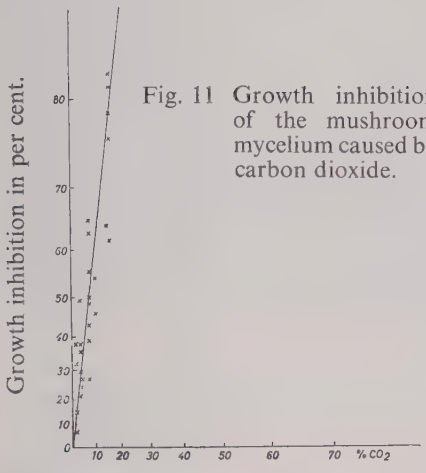


Fig. 11 Growth inhibition of the mushroom mycelium caused by carbon dioxide.

Extract from " *Die Deutsche Gartenbauwirtschaft** 7*th year* —*No.* 12—*December*, 1959

From the Max-Planck Institute for Plant Cultivation, Hamburg-Volksdorf.
(Director: Prof. Dr. R. v. Sengbusch)

ACTIVE MYCELIUM SPAWNING OF CULTIVATED MUSHROOMS

(*Preliminary Report*)

By **W. Huhnke and R. v. Sengbusch**

Methods of Spawning and Cultivation so far

The growing of cultivated mushrooms has developed from old, classical, and extensive methods of cultivation to modern and intensified processes. The classical methods consisted of cultivation on soil beds, i.e., on the floor area available for cultivation, in the form of mounds or plots. This form of cultivation is the most extensive. In order better to utilize the space available for cultivation, also in the vertical direction, the shelf system was developed whereby the productive capacity of the space available is increased by multiplication of the floor area. A further intensification was achieved by the modern tray system whereby, in addition to the multiplication by superposition of the area available for cultivation, much valuable time was saved by the quicker succession of cultivations made possible by centralizing pasteurization and development in appointed places. The methods of cultivation have been further improved by speedier composting, pasteurization, mechanization, and the application of new techniques.

An essential factor in all methods of cultivation is the " penetration " with spawn, i.e., the inoculation of the natural or synthetic nutritive compost with mushroom mycelium bred from germinated spores

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grown or also having vegetatively multiplied on a suitable nutritive medium. The success or failure of any cultivation of mushrooms is closely traceable from the way in which the spawn has been made to penetrate the nutritive compost. Both the development of the so-called mushroom spawn and the methods whereby this is used have, in the course of time, undergone considerable changes and improvements.

The classical method consisted of the application of the spawn to more or less prepared quantities of horse dung which were formed into so-called " spawn bricks " and then used to a varying extent for the penetration of the beds under cultivation. This procedure was carried out in such a way that a minimum of manure spawn was introduced immediately below the surface of the bed formed by the nutritive compost according to a definite system of division.

The preparation of the spawn which, to begin with, was carried out by the mushroom growers themselves, gradually passed over to specialist concerns which were able to make important advances by modern scientific methods, both as regards the sterile hygienic production of pure cultivation and the breeding of new and productive varieties. In addition to various other sterile nutritive substances, grain was employed in the spawning processes. These so-called " grain spawns ", used when as fresh as possible, proved a real success and have come to meet a great portion of spawn requirements

The methods of spawning also have undergone changes which have led to improvements. To-day, grain spawn is, for the most part, not spot planted but broadcast. The method has been further simplified by the use of machines.

The so-called " through spawning " according to Hauser (Switzerland) consists of the spawn (principally grain spawn) being mixed with the whole of the nutritive compost. This is done both by hand and by a machine specially constructed for this purpose. Here, a larger quantity of spawn than that which is normally used is required. The advantage of this lies in the greater number of points at which inoculation can take place by even distribution over the whole of the nutritive compost. The disadvantage lies in the greater demand for spawn which is quite expensive.

Riber Rasmussen (Denmark) recently revealed a method developed by him called " shake-up spawning ". Essentially, this method consists in that about ten to sixteen days after the normal introduction, when the mycelium has penetrated the nutritive compost about half way, the whole of the compost is turned over and the parts which have, and those which have not, been penetrated by the mycelium are thoroughly mixed throughout. This method ensures that the " many " points at which inoculation can take place by " through spawning " are covered to an even greater extent than is possible with Hauser's method. On the other hand the action takes place considerably later and requires more time. With this method, Riber Rasmussen has been able to achieve better results in development and greater productivity particularly in respect of the early weeks of production.

"Active Mycelium Penetration Method"

In July, 1959, the authors developed the "Active Mycelium Penetration Method" which represents a consequent intensification of the results aimed at with the methods just mentioned with a view to achieving the maximum. The essential aspect of this method is that the "active", i.e., mycelium still vigorous and virgin, is thoroughly mixed and spread into all parts of the freshly pasteurized nutritive compost in considerable larger quantities (i.e., about twenty times that usually administered).

The relatively large quantity of active mycelium required for this method is produced by a preparatory mixing of grain spawn, manure spawn, or any other available spawn and is then applied to a prepared and pasteurized compost. This means that each quantity of compost which has been fully penetrated by mycelium becomes the carrier of the "active" mycelium and is thus ready for use. Then, whilst it is still in the condition of highest possible breeding activity and, before any decline in activity takes place, this mycelium is used for spawning without delay. As a result of the preparatory increase of the originally small quantity of spawn, quantities far above those normally used will be available. Then, as is the case with "mixed spawning", the active mycelium is thoroughly mixed with all the compost to be spawned. For the subsequent stages of cultivation it is thus not necessary to rely solely on the initial mycelium. Instead there will be ever freshly bred active mycelium available with which to spawn the compost which is in turn intended to provide the breeding ground for the production of still further active mycelium. In a mushroom-growing concern, with about fortnightly changeovers in the successive stages of cultivation, the breeding of active mycelium can be carried out concurrently. If the periods of time between the individual stages are longer it will be necessary to arrange for interim breeding of active mycelium in order to ensure the greatest possible vitality. The last inoculation of the "active mycelium compost" should not precede the penetration of the compost intended for actual use by more than a fortnight or so. In a normal concern employing the tray system of cultivation and with appointed places for pasteurization and development no specific provisions are necessary. Merely 5 to 10% more trays will have to be filled, pasteuerized, and branched off for the production of "active mycelium". The normal conditions for growing apply here, too: 75° F. in the place reserved for spawn growing approximately 100% relative humidity, little ventilation, and little air circulation. This method is also practicable in case of the shelf system. The production of "active mycelium" would, however, have to be adapted to this sytem which with some planning should not prove difficult.

The methods of spawning customary until now employ mycelium which is not yet fully active and still in its nutritive element at the time of use. In order to achieve maximum breeding capacity it wants a certain amount of time to develop. "Active mycelium" on the other hand, being in a state of lively growth immediately continues its

continued on page 213

No quality is hig

— MOUNT TI

(GRAIN or

More and more Growers use

MOUNT Mushroom Spawn every month . . .

Two recent cases of exceptionally good cropping off

MOUNT WHITE GRAIN

One, a shelf grower who on successive crops picked in excess of 3,000 lbs. off 1,500 feet in the remarkably short picking time of 3 weeks 6 days

The other, a tray grower using a shallow tray with not more than 4″ of compost, is cropping 390 lbs. of mushrooms to the ton (8 cubic yards) of manure. Both have one thing in common: excellent crops of excellent quality, and of course

MOUNT SPAWN

SOLE DISTRIBUTORS

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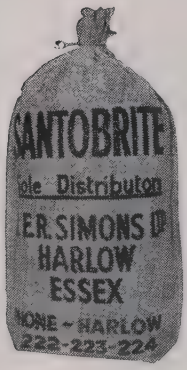
NOTE OUR NEW PHONE NUMBERS

...er than the top

...E SUMMIT!

...ANURE)

THE BEST GROWERS
also use **SANTOBRITE**
as a Routine Treatment — in
10 lb. Bags and 80 lb. Cases



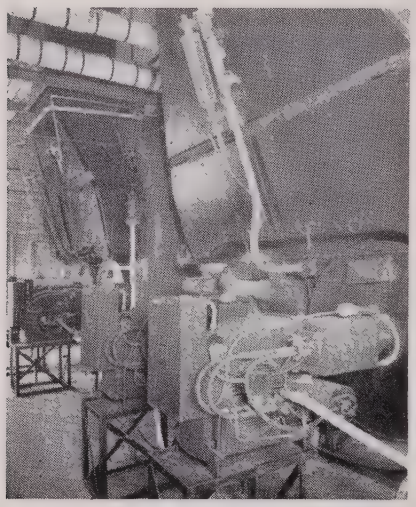
Ask for ***SANTOBRITE*** *Leaflet*
"THE TRAY CLEANER"

SANTOBRITE ensures a clean start and preserves your trays and woodwork

- HARLOW - ESSEX
. . HARLOW 222, 223, 224

HORTICULTURAL IMPROVEMENT SCHEME

BURGESS & CO. (ENGINEERS) LTD., place their unrivalled experience in Mushroom House Heating at growers' service in the preparation of acceptable schemes to improve their heating systems, which will qualify for the **Government Grant of 1/3rd of the capital cost.**



These two boilers, rated at 10 million B.T.U.'s were supplied and just installed by BURGESS & Co. to replace 22 tubular hot water boilers and to heat approximately 5 ACRES of glass. Each of the steam boilers is fitted with TWO Brockhouse F A P 190 oil burners using 960 sec. fuel oil. TWO 12,000 gallon oil storage tanks were fitted and each is complete with electric and steam preheaters. Steam mains have been run round the nursery to serve seven steam/hot water calorifiers, all thermostatically controlled, situated in place of the original boilers.

THIS INSTALLATION HAS BEEN CARRIED OUT FOR

Messrs. MILTON NURSERIES, Milton, Cambridge

We are Specialists in Heating Mushroom Farms & Glasshouses

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BROXBOURNE HERTS. *Tel.: Hoddesdon 2305*

•

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•

LEITH EDINBURGH *Tel.: Leith 31056*

from page 208

development, and thus the penetration of the nutritive compost, without interruption after the spawning has taken place. This by itself makes for a quicker process of penetration. It is intensified by the simultaneous use of a very large quantity of mycelium and its even distribution throughout the nutritive substratum whereby a maximum of inoculation points are served. The use of spawn in such large quantities would seem prohibitive for economic, if no other reasons. Riber Rasmussen's system of " shake up spawning " resembles the system of " active mycelium penetration " insofar as, at the time of the shaking up and mixing processes, i.e., after ten to sixteen days, equally active mycelium obtained through pulling apart and mixing, is available in big quantities for inoculation at numerous points. The vital difference lies in the fact that Riber Rasmussen's method is based on normal spawn and, to arrive at the production of active mycelium, requires a period of preparation lasting from ten to sixteen days and, besides, a second additional operation. It is just the penetration starting immediately on pasteurization of the compost with mycelium that constitutes an advantage of the " active mycelium method ". Freshly pasteurized compost is an excellent nutritive element and is receptive to all possible forms of micro-organisms, including those parasitic upon or damaging to mushrooms, until it has been sufficiently penetrated by the mushroom mycelium, and exterior infections have to a great extent been ruled out by its inherent antibiotic effects. One of the advantages of the " active mycelium penetration " lies in the shortening of this period of vulnerability.

The decisive advantage of the new method for practical use is, however, to be seen in the time saving factor. As the process of penetration of compost by " active mycelium " is considerably quicker than the result obtained with normal methods, it is consequently possible to case earlier.

It is known that the time of the first fructification closely correlates to the time when the casing takes place. Since casing can be done earlier, the period between the spawning and first picking can be shortened by between 7 and 14 days. Tentative tests indicate that it might be possible to case immediately after spawning. Considerable operational advantages will be derived from this saving of time. This should particularly affect the tray system. Here, the relatively long period of preparation occupied by pasteurization, spawning, and development before picking can be reduced from 4—5 weeks to about 3—4 weeks. It was further indicated that the initial succession of flushes was particularly strong and that one flush followed quickly after the other so that the time required for the whole crop was considerably shorter. This makes it possible to have one crop follow the other at shorter intervals, i.e., to carry through a greater number of crops per year. It was further observed that the " active mycelium " was also able effectively to penetrate compost of inferior composition such as proved insufficiently receptive to grain spawn, and that satisfactory crops were obtained in these cases as well.

A further advantage of the " active mycelium " method lies in the small consumption of spawn and the subsequent reduction in the cost of production. To initiate the process which will produce the " active mycelium " only about 10% of the spawn otherwise required is needed in the form of a pure ingredient for mixing. In the following processes, there is continuous re-creation of " active mycelium " from the " active mycelium " already available. It is, however, advisable to add some further pure spawn with which to " freshen up " the "active mycelium " after a certain period of breeding. How often this has to be done is still to be established experimentally.

The fact that about 10% more nutritive compost is required that would otherwise be needed for the production of " active mycelium " may be considered a disadvantage. This additional expenditure is, however, more than compensated for by the smaller quantities of spawn required. Also, the cultivation space will have to be increased by about 10% when this method is used. However, as it is often the case that the space available is not being fully utilized there may be instances where this consideration is of no importance.

Another disadvantage may be seen in the greater amount of time required for the planting of the " active mycelium ", but this problem can, of course, be solved by the use of a spawning machine.

The strongest argument against spawning with " active mycelium " is the possibility of the occurrence and spreading of parasites and diseases. This has to be taken very seriously indeed. It must be emphasized that the method should only be employed by growers who observe the strictest hygiene and control of diseases within their establishments. If all the necessary precautions are carefully observed the disadvantages mentioned will be overcome without difficulty. It can be assumed with great probability that the " active mycelium penetration method " can lead to a further increase in productivity in the growing of mushrooms.

We decided to announce this new method after experiments had yielded favourable results and opened up interesting prospects as an encouragement to those engaged in research and in practical work to try for themselves and to exchange information on the findings. The results of experiments still in progress will be published on completion.

contd. on page 232

FANCY THAT

The Secretary has been sent, by the Canada Department of Agriculture, a booklet on ' The Effects of Decay on the Production of Trembling Aspen Pulpwood in the Upper Pic Region of Ontario '.

STANLEY
MIDDLEBROOK'S

PINHEADS

205. My forecasts occasionally go wrong. In March I predicted a **Low-price/Over-production** panic in July. If the Editor and Chairman (April and May Editorials) speak for the industry as a whole (which I doubt) then growers are waking up to the dangers more quickly than I expected. It has long seemed to me that a mushroom grower has to be hit pretty hard before his senses register. For example, the first fly means nothing—the danger is only realised when thousands of them choke him. He only wants research when he's utterly lost. Equally he's only willing to consider the dangers of over-production and under-publicity (or the operation of the laws of supply and demand—the same thing) when he's selling at well below cost. By then he can't afford adequate funds to save himself. I've been plugging these dangers for a long time, and with what results? The opposite to those intended! Increased production is proclaimed progressive, and publicity contributions are conditionally levied at half the voluntary figure. We were told by Mr. Berry, at the A.G.M. (Bull. 125, p. 170) that he *thought* the compulsory 3d. would produce as much as the voluntary 6d. Suppose he's right, what have you got? £8,000? £1,000 spent on publicity, Mr. Berry believes, is worth far more than twice £500. If that is so, £32,000 must be worth a great deal more than four times £8,000 (my advocated 1/- per carton against the present 3d.). Now you can do a lot more with £32,000 than with £8,000, and if expansion is inevitable, increased use of spawn on that score alone (not to mention the spawnmakers' constant nagging that we—and they?—would be better with double rate spawning) will give you something like a workable sum for publicity, and, By George, you're going to need it. How on earth do you hope to keep demand abreast of supply with £8,000 p.a.? Let's stop whiffling and become realistic. I suggest to the Committee that it should get down seriously to the problem of raising the levy to 1/- per carton by the end of August—after the summer drop—when growers are beginning to feel more cheerful again. The plain fact is someone has to look into the future for growers in general, and if not the MGA Executive then who will?

206. Two or three points in the May Editorial invite comment. First, to improve efficiency means either aiming at obtaining the same yield at lower cost, or increasing the yield at the same or lower cost. The cost of increasing the efficiency of an established layout may be more than the cost of increasing growing area. I contend that any major increase in yield is more likely to come from an outside source (better raw materials, or long periods of favourable climatic conditions, etc.) than from fiddling with theoretical scientific ideas or gimmicks. Given continued good common sense cultivation and a price at anything above costs the surest way to get more mushrooms and more profit is to increase growing area, and I'd like to see anyone disprove it *in practice*.

Second, I'm pleased to see the Chairman reflects my own views, "If we expand production faster than we increase demand, many of us are headed for the rocks". Precisely. How utterly true. Why

can't *everyone* see it? What in fact are we doing but just that? You can't *see* it? O.K. You'll have to *feel* it first.

Third, I presume Stanley-Evans was tilting at me when he wrote that the good work of the MGA " will be thrown away if members won't put their own association before say an Oil Company . . . " (Bull. 125, p. 162). His previous Oil Rep. was a personal friend who " quite understood " his change to the MGA Company. (What do you expect of a friend anyway?) In my case I have no friend in my Oil Co., and my decision to remain with them was taken after a long period of heart searching—Alderton will bear witness to that. Many businesses are built up on good faith, confidence, contract-honouring, and so on. I could have broken my 4-year contract with the Co. but I do not like people who break contracts with me. Stanley-Evans and many others think I'm wrong. O.K. Maybe I am, but let's have no cant about who is thinking of his own interests instead of other peoples'. I may be a cynic, but I believe every grower wanted a rebate for *himself*, not for other people.

207. Here are three extracts to indicate the tone of an article which appeared in *The Financial Times* on 13th May, headed " Farmers at the Cross Roads ".

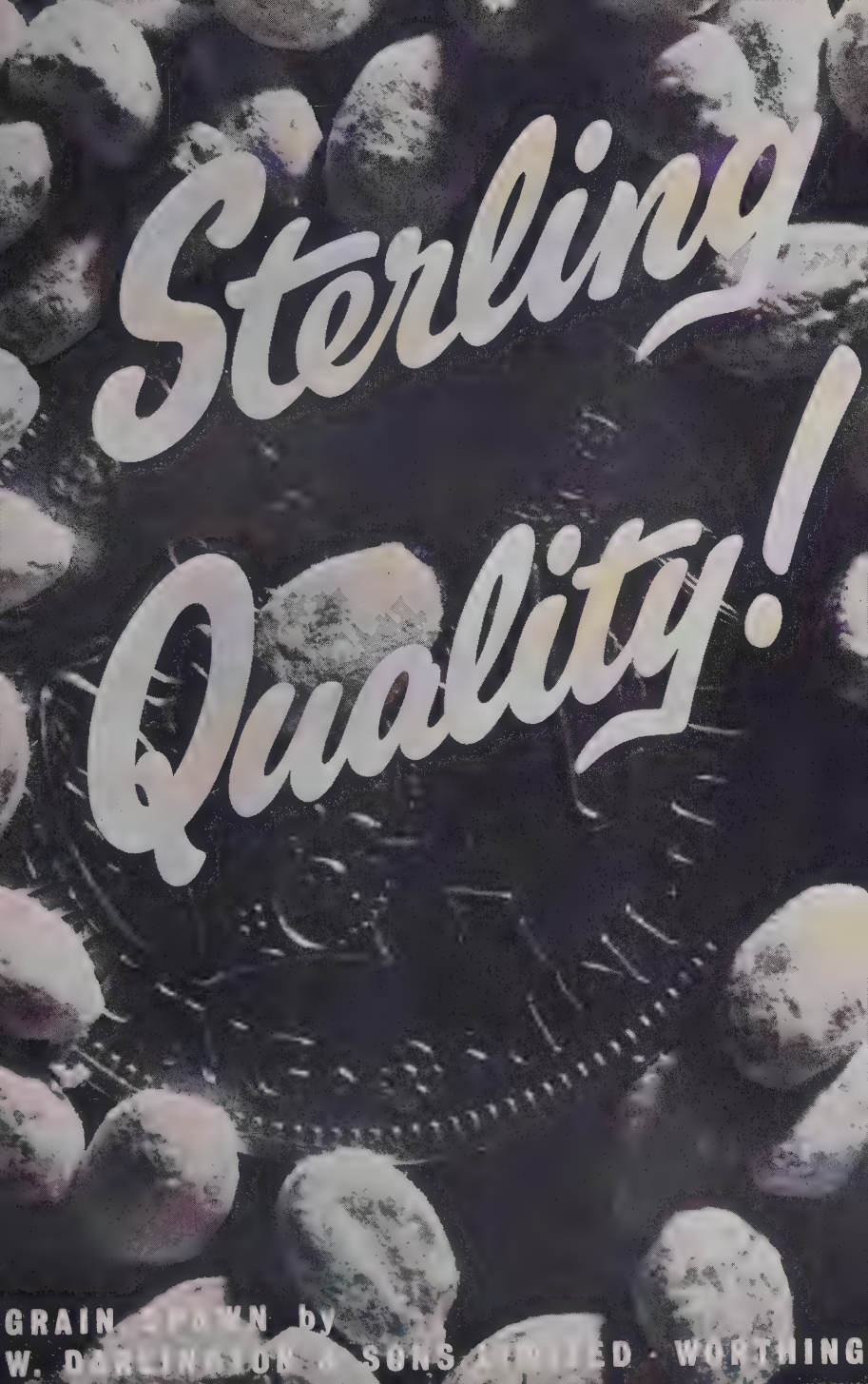
1. " . . . Work study and farm management advice had a part to play in improving skills, provided they did not lead to over-production. There was no future in producing more than the public would buy ".

2. (Referring to the NFU). " More recently, with the Marketing Boards, it announced the setting up of the British Foods Council, which will do public relations work on an initial budget of £18,000 a year. This is not much of an answer to the Danish producers, who now subscribe £1m. annually for similar purposes . . . "

3. " For too long agricultural thinking has been dominated by committees of Canutes, confident that with the NFU behind them the tide would not come in. Now there is a spirit of resourcefulness abroad. Farmers are getting the notion that the future rests with them . . . "

208. I see Tomato growers are to be helped by an increased tariff. The Editor of *The Grower* (14th May), commenting on this, makes the following point: " . . . It is doubtful if the Government will be able to increase any Horticultural tariff again, with the possible exception of lettuce . . . " We've had it! We've dilly-dallied ourselves into over-production and low prices and now we've dilly-dallied ourselves out of any possibility of increased tariff.

209. Ernest Palfrey visited here. According to him, if a grower or business man can't make his job pay it is economically sound that he should be allowed to fail and drop out. This did not prevent Ernest enjoying with pronounced relish a good round meal of subsidised farm products. From my interpretation of his arguments the more prosperous our country is the more economically unsound it has become.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W. DARLINGTON & SONS LIMITED · WORTHING

EXPANDING PRODUCTION AND THE FUTURE OF MUSHROOM GROWING

DR. R. L. EDWARDS, Ph.D., B.Sc., F.R.I.C.

We have had Editorial exhortations and moans from members on this subject for several years now, and both may be, in their way, justified; I think the latter are a little unrealistic and ventured to say so at the A.G.M. Since Mr. Pinhead has accused me of approving of the expansion policy—between the lines—it may be a good thing if I make my point of view perfectly clear, leaving nothing intended to be read between the lines.

It would undoubtedly be a bad thing for many growers, if production increased so rapidly as to outstrip demand all the year round sufficiently to cause a large fall in average selling price. If we as an Association think this is likely to happen, as apparently some members do, then we should consider seriously what, if anything, we can do to prevent it happening, or to minimise the damage to ourselves individually and as an industry.

Quite clearly neither the Association nor anyone else can at present forbid individual growers or the whole body of growers to increase either their cropping area or their output from their existing area. The only possible form of control of output which I can see is the one now applied to hops through the Hop Marketing Board. Under their scheme each hop grower has a fixed quota which he may produce and sell through the Marketing Board and competitive expansion is impossible, because any grower who produces more than his quota simply cannot sell them. There is a fixed price and the law of supply and demand does not operate. I do not know exactly what the situation is now, but several years ago when I heard an account of the working of the hop scheme, it was profitable enough for growers to be able to sell their right to a hop production quota.

Do those members who make a song about other growers' expansion want this sort of scheme for mushrooms? If they do let them say so and be logical by starting a campaign for it. If not, have they any other measures to suggest for limiting production? It seems to me the absolute essence of futility for growers who have expanded their farms in recent years—and I am not trying to be personal in saying this -to urge that no one else should expand now. It is far too much like " I'm all right Jack ".

Naturally we would all like to sell all the mushrooms we produce at a comfortable profit, but there is no way of compelling anyone to buy them; we are in business, not in Utopia, so what can we do about it?

Higher yields reduce the cost per lb. because most of the cost of production is fairly directly related to bed area. Quicker cropping reduces the proportion of many overhead costs per crop and per lb.

Mechanisation wisely used can reduce labour costs. All of these can therefore help to maintain a margin of profit from a lower selling price if and when it comes.

So far I have tried to confine myself fairly strictly to matters of fact, with only an occasional expression of personal opinion, but there is a lot more which could be said. I think our growing knowledge of ventilation will provide means of improving quality, for those who will take some trouble to use it, and so give them better prices for a greater proportion of their output. I should think more efforts might be made to induce retailers to reduce their prices when they can buy more cheaply, which many of them do not do, and so sell more mushrooms than they do now at less profit per lb., but the same total profit because of the greater turnover.

But the main point I wished to make at the A.G.M. and now, is that it is no use crying out against the results of other growers' expansion when we cannot prevent it and in many cases either have recently expanded our farms or intend to do so. This is not " warm encouragement" of anyone's expansion, merely an acknowledgement of people's right to please themselves.

LARGE FARM STARTED IN NORFOLK

Production Mainly for Soups.

I have been asked by the Editor to write a short note for the MGA Bulletin about The Blue Riband Mushroom Company Limited which has lately been formed in Norfolk.

Although certain articles appeared in National newspapers, the Company does not wish for, nor does it need, publicity.

The object of the Company is to produce a good quality mushroom at an economic price and the Company hope that this will be achieved by centralisation, and, as far as possible, by mechanisation.

The bulk of the produce will not be sold on the open market, but will be sent daily to the kitchens of Campbells Soups Ltd. at King's Lynn for the production of Campbell's Cream of Mushroom Soup.

Initially, 52,000 sq. ft. will be put down to cropping. The Company's programme is that this area will increase substantially within a very short time.

The entire farm has therefore been planned in advance. The composting area, pasteurising and spawn-running rooms have been designed to cope with the total output, and likewise the ancillary buildings. The farm will eventually cover an area of seven acres.

The Company is not a subsidiary of Campbells Soups Ltd. The capital needed for this project has been found mainly by Norfolk farmers but there is a close and friendly liaison with Campbells, who are giving every help to the project.

It is anticipated that production will start in October, 1960.

Geoffrey Britton.

The CULVERWELL *Manure Turner*

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ELECTRIC
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INCOME AND EXPENDITURE ACCOUNT FOR

1958 £		£ s. d.	£ s. d.
1,767	Salaries, Clerical Assistance and Superannuation Contributions		1,991 7 1
210	Office Rent		210 0 0
404	Postages, Printing and Stationery		369 16 4
45	Telephone and Telegrams		67 18 3
71	Travelling, Hotel and Entertainment Expenses		98 19 11
58	Cost of Annual General Meeting and Luncheon, *less* Sales of Tickets		55 14 6
249	Cost of Executive Committee and Special Meetings		157 5 0
—	Cost of Copenhagen Trip (Net)		82 15 3
	Cost of Folkestone Exhibition	1,095 15 6	
—	*Less:* Rent of Space and Sundry Receipts	947 2 8	
			148 12 10
105	Cost of Bournemouth Exhibition		— — —
163	Reciprocal Vist—Dr. Kneebone and F. C. Atkins		— — —
65	Cost of Bulletins (including "Digest") and Literature		— — —
150	Contribution to National Farmers' Union		150 0 0
13	Subscriptions to Trade Journals, etc.		13 11 0
58	Audit and Accountancy		63 0 0
86	General Expenses		94 11 4
15	Depreciation of Office Equipment		22 14 3
3,459			3,526 5 9
32	*Balance* being Excess of Income over Expenditure for the year, transferred to Accumulated Fund		406 4 7
£3,491			£3,932 10 4

PUBLICITY FUND ACCOUNT FOR THE

1958 £		£ s. d.
—	Show Expenses	45 0 9
223	Pre-Packaging Exhibition	— — —
1,142	Display and General Advertising	4,360 11 2
1,786	Public Relations	1,152 5 11
671	Paper Bags, Aprons and Cartons, *less* Stock in Hand	602 2 3
239	Cost of Literature, *less* Sales and Stock in Hand	271 0 0
93	Committee Meeting Expenses	133 8 0
750	Administration Expenses	750 0 0
97	Printing, Postages and Miscellaneous Expenses	87 7 5
		7,401 15 6
—	*Balance* being Excess of Income over Expenditure for the year, transferred to Publicity Fund	1,595 15 0
£5,001		£8,997 10 6

ACCOUNTS

THE YEAR ENDED 31st OCTOBER, 1959

1958 £		£ s. d.	£ s. d.
2,037	Subscriptions from Ordinary Members	2,351 1 6	
678	Subscriptions from Associate Members	694 1 0	
			3,045 2 6
26	Sundry Receipts		1 12 6
750	Proportion of Administration Expenses charged to Publicity Fund		750 0 0
	Donations from Members for Belgium Mine Relief Fund	440 8 10	
—	*Less:* Amounts paid over	440 8 10	
			- -
	Sale of Advertising Space in Bulletin, Sale of Bulletins and Literature	2,364 15 4	
	Stock of Saleable Literature—31st October, 1959	100 0 0	
		2,464 15 4	
	Less: Cost of Bulletins (including "Digest") and Literature 2,139 0 0		
	Add: Stock of Saleable Literature 1st November, 1958 190 0 0		
		2,329 0 0	
			135 15 4
£3,491			£3,932 10 4

YEAR ENDED 31ST OCTOBER, 1959

1958 £		£ s. d.	£ s. d.
3,964	Spawn Contribution..		8,241 13 0
703	Contributions from Salesmen	663 18 10	
31	Contributions from Sundriesmen	56 10 0	
			720 8 10
80	Sundry Receipts		35 8 8
4,778			
223	*Balance* being Excess of Expenditure over Income for the year, transferred to Publicity Fund		
£5,001			£8,997 10 6

BALANCE SHEET AS AT

LIABILITIES

1958 £		£ s. d.	£ s. d.
	SUNDRY CREDITORS AND CREDIT BALANCES:		
824	General	1,023 6 0	
600	Publicity	363 19 1	
670	Estimated Subscriptions received in advance	675 0 0	
			2,062 5 1
	PUBLICITY FUND:		
	Balance as at 1st November, 1958 ..	2,053 18 7	
	Add: Excess of Income over Expenditure		
2,054	for the year to date	1,595 15 0	
			3,649 13 7
	ACCUMULATED FUND:		
	Balance brought forward 1st November, 1958 ..	777 7 3	
	Add: Excess of Income over Expenditure		
777	for the year to date	406 4 7	
			1,183 11 10
£4,925			£6,895 10 6

We hereby certify that the above Balance Sheet has been correctly drawn up in accordance with the books and records of the Association.

110 CANNON STREET, LONDON, E.C.4.
9th March, 1960.

1960 CONFERENCE AT WESTON

Dr. E. B. Lambert (U.S.A.) and Dr. R. von Sengbusch (Germany) may be among the speakers

Dr. E. B. Lambert, Plant Pathologist at the Crops Research Division of the United States Department of Agriculture at Beltsville, Maryland, and Dr. R. von Sengbusch, Director of Research at the Max-Planck Institut fur Zuchtungsforschung at Hamburg, Germany, may both speak at the Mushroom Industry Conference which takes place at The Grand Atlantic Hotel, Weston-Super-Mare, on 10th, 11th and 12th October.

Among the additional papers to be given are a number which deal with the practical side of mushroom growing and already, judged by the interest taken in the preliminary arrangements, a large attendance is practically certain.

All MGA members who intend to be present are warned that the accommodation at The Grand Atlantic Hotel is strictly limited and bookings should be made without delay.

The full programme starting with a "Get Together" on 10th October, will be published in the July Bulletin.

31ST OCTOBER, 1959

ASSETS

1958		£ s. d.	£ s. d.
£			
26	CASH IN HANDS OF SECRETARY		9 19 1
	CASH AT NATIONAL PROVINCIAL BANK LTD.:		
983	General Account	375 9 3	
2,226	Publicity Account	4,495 10 3	
			4,870 19 6
	SUNDRY DEBTORS AND DEBIT BALANCES ..	1,744 11 11	
1,230	*Less:* Reserve for Doubtful Debts ..	50 0 0	
			1,694 11 11
	STOCK OF SALEABLE LITERATURE (as estimated by		
290	Secretary)	125 0 0	
30	STOCK OF CARTONS	15 0 0	
			140 0 0
	OFFICE EQUIPMENT—Balance as at 1st November,		
	1958	140 0 0	
	Add: Purchases of Equipment during year ..	62 14 3	
		202 14 3	
140	*Less:* Depreciation	22 14 3	
			180 0 0
£4,925			£6,895 10 6

accordance with the books, records, vouchers, information and explanations given to us.

SPENCER, FELLOWS & CO.
Chartered Accountants.

1960 PUBLICITY CONTRIBUTIONS

Salesmen :	£ s. d.
Francis Nicholls Ltd., Smithfield Market, Birmingham	157 10 0
T. J. Poupart Ltd., Covent Garden, London, W.C.2	115 10 0
R. E. Jenkinson Ltd., Covent Garden, London, W.C.	105 0 0
Dan Wuille & Co. Ltd., Covent Garden, London, W.C.	100 0 0
Geo. Jackson & Co. Ltd., Smithfield Market, Birmingham	50 0 0
Wm. Morgan & Co. Ltd., Custom House Street, Cardiff	5 5 0
Ernest White Ltd., Kirkgate Market, Leeds	5 0 0
Reuben Levy Ltd., 88 Spitalfields Market, London, S.E.1	3 15 3
Ed. H. Lewis & Son Ltd., Covent Garden, London, W.C.2 ..	5 5 0
Ernest Broadbelt Ltd., Smithfield Market, Manchester 4	5 5 0
Jackson & Lakin Ltd., Nottingham	4 8 4
G. E. Leatherland Ltd., 20-22 St. Andrew's Street, Newcastle-on-Tyne	44 6 3

***Spawn Merchants :**
W. Darlington & Sons, Ltd., Southcourt Road, Worthing, Sussex
Monlough Food Production Co. Ltd., Ballygowan, Belfast
H. Mount & Sons, Ltd., Littlebourne, Canterbury, Kent .. ..
S. A. F. Sampson Ltd., Oving, Chichester.
White Queen Ltd., Yaxley, Peterborough.

Sundriesmen :	
Bradford Fertilizer Co. Ltd., Whitefield Place, Girlington, Bradford	10 10 0
Arthur Coomer Ltd., Farlington, Portsmouth, Hants.	10 10 0

*Amounts collected by spawn merchants are not for publication.

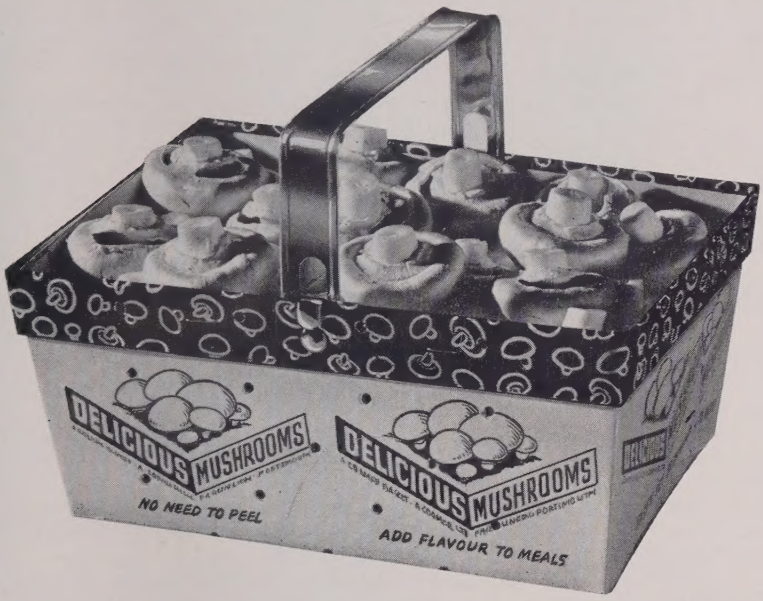
LAST MONTH'S PUBLICITY CONTRIBUTIONS

	£	s.	d.
Sundriesmen:			
Shirley Organics Ltd., Vicarage Wharf, Battersea, S.W.11.. ..	25	0	0
Salesmen:			
†Reuben Levy Ltd., 88 Spitalfields Market, London, S.E.1 ..	2	8	5

***Spawn Merchants:**
Monlough Food Production Co. Ltd., Ballygowan, Belfast.
White Queen Ltd., Yaxley, Peterborough (2).
S. A. F. Sampson Ltd., Oving, Chichester, Sussex.

†Previous contributions already acknowledged.
*Amounts collected by Spawn Merchants are not for publication.

Coomer's
MUSHROOM BASKETS



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